should there be a return of rains, following a rainy season, so soon after the rainy season that the annuals are still living, the rudimentary roots quickly develop, enabling the plant to complete its growth, or to renew it. The matter of distance of water transport in the annuals would hardly come into the problem.

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THE EFFECT OF NARCOTICS UPON THE DEVELOPMENT OF THE HEN'S EGG

ONE of the evident difficulties experienced in experimentation with the eggs of birds is that due to their large size, which makes it impossible to use the large numbers of eggs that may be handled in the case of fishes or amphibians. Also, while it is usually possible to obtain eggs at any season of the year, if one be willing to pay the price, the percentage of infertile eggs is usually so high except during the spring that the time for profitable experimentation is quite limited.

The experiments here described are of a purely preliminary nature. It is the purpose of the writer to continue the experiments until the number of eggs used will justify some general conclusions.

The reagents used were alcohol, ether, chloroform, chlorotone and magnesium chloride. One or two of these proved so almost universally fatal in their effects that they will probably not be employed in further experimentation.

Alcohol.—This reagent was employed as follows: the eggs were placed in the incubator and left for a number of hours (five to seventeen, in different experiments); they were then placed in a glass specimen jar having a glass cover, with raw cotton wet with from 1 to 5 c.c. of 95 per cent. alcohol; the jar was covered and replaced in the incubator, where it was left for from three to twelve hours, after which the eggs were removed from the atmosphere of alcohol, thoroughly aired and replaced in the incubator (which had also been aired) for about forty-eight hours before being opened. The glass jar was of about 1,200 c.c. capacity, and not more than eight eggs were placed in it at once, so that there was a considerable volume of air for each egg. When the lid was removed, to take the eggs from the jar, there was always a strong smell of alcohol.

Of the eggs treated in this way only about 25 per cent. contained living embryos when opened. About half of the embryos obtained from these eggs were abnormal to a greater or less extent. The character of the abnormalities will be described when further experiments have furnished more material.

Ether.—The experiments with ether were conducted in the same general manner as those with alcohol, except that, as a rule, only 1 or 2 c.c. of ether were used.

The effect of ether seemed to be much less severe than that of alcohol, only about 35 per cent. of the embryos being killed. Of the embryos removed from the eggs, less than half were abnormal.

Chloroform.—Chloroform was employed in the same manner as was ether, and, while fewer experiments were tried, not a single egg, opened after being submitted to this reagent, contained a living embryo, showing that it is much more toxic in effect, under these conditions, than either alcohol or ether.

Chlorotone.—This reagent was employed as a .1 per cent. solution in distilled water. In one experiment the eggs were kept in the incubator for ten hours before introducing the chlorotone; in the other experiments the chlorotone was introduced into the fresh egg. The method employed was to carefully remove about a square centimeter of shell from the side of the egg, and, with a clean glass tube, blow out about 5 to 10 c.c. of the albumen, without touching the yolk; the space thus made was filled with the reagent; the opening was then sealed with a piece of fresh shell, with strips of shell membrane stuck around the edge with some of the albumen that had been blown out of the egg. This is the method of closing an incubating egg used by Miss Peebles.

This treatment proved fatal to more than 90 per cent. of the embryos, but a few control experiments, where the eggs were opened and

sealed again without introducing any foreign substance, gave such a large percentage of fatalities that too large a percentage of fatalities in the experiments proper should not be attributed to the reagent.

Magnesium Chloride.—The magnesium chloride was employed as a 10 per cent., 16 per cent. and 33 per cent. dilution of the molecular solution of the salt in normal salt solution; that is to say, ten parts of the molecular solution of magnesium chloride were diluted with ninety parts of normal salt solution; etc.

The reagent was introduced into the eggs in the same manner as was the chlorotone; in some cases into fresh eggs, in other cases into the eggs after they had been in the incubator from ten to twenty hours.

The effect of these weak magnesium chloride solutions was about the same as the chlorotone, the embryos being killed in practically every case, or, at least, the process of incubation was inhibited. As in the case of chlorotone the results were here largely vitiated by faulty technic in opening and closing the eggs for the introduction of the reagent.

These preliminary experiments, as has been said, while too limited in number to give definite results, will serve as a guide for further work, especially in regard to the character and strength of reagents and the length of time they should be allowed to act.

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Inhibition of Cell Division in Paramœcium

In connection with the discussion of "potential immortality" in Protozoa (in other words, their ability to continue their physical existence indefinitely, barring accident and disease, through the bodily "splitting up" of each individual into its two offspring, each repeating the process, which is continued "*ad infinitum*") it may be of some interest to note the length of time an individual has been observed to maintain its identity—in other words, to continue living, without dividing into its progeny. The writer has succeeded in preventing one specimen of *Paramœcium caudatum* from dividing, for the space of a little over thirty-two days, by keeping it confined in capillary tubes of bores too small to permit it to turn back readily.

Control specimens had meanwhile divided on an average of once a day. In other words, if the confined specimen had been allowed to divide unmolested, it would have divided into four billion, two hundred and ninety-four million, nine hundred and sixty-seven thousand, two hundred and ninety-six offspring!

The irritation caused by the confining walls is doubtless a factor of as great importance as the accumulation of the products of excretion, and the lack of nutrition; since specimens which were daily taken from their tubes and allowed to swim about in a fresh infusion containing an abundance of *Bacterium termo,* for a number of hours before being transferred to new tubes, nevertheless refused to divide.

Particles which appear to be cast-off portions of the specimen's body, were frequently observed in the tubes with individuals thus treated, thus suggesting that increase of protoplasmic bulk may take place without the customary sequence of cell division, even in well-nourished individuals.

Conklin's observations on *Crepidula* seem to indicate that the dwarfing of those forms in small hermit crab shells (dwarf forms being always found in small hermit shells, and "giant" forms in large hermit shells) is due to an inhibition of cell division, since the difference in size is due to the difference in the number of cells, rather than to differences in cell size. Crustacea, Echinodermata, Mollusca, Amphibia, etc., reared in small vessels are always dwarfed, and this too must be due to an inhibition of cell division.

In the case of *Crepidula,* the fact that the hermit shells are open to the ocean would indicate that the accumulation of waste products, and lack of proper nutrition can hardly be regarded as a sole, or even the chief, cause of this inhibition of cell division, and the writer is inclined to the opinion that narrower confinement in some way acts as an important factor in the process.